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PRESIDENT'S MESSAGE

A number of recent events indicate that the next few months will be of particular importance in settling the long-range directions of development of the Arboretum.

The project of updating the Olmsted plan, which has long been the basic design for the development of the Arboretum, has been awarded to the Seattle firm of Jones & Jones. We are particularly encouraged by the commitment of continuation of the Arboretum concept expressed by the City of Seattle and the University of Washington, which was contained in their joint request for proposals. This update project, which is supposed to be completed within about six months, should be of major value in rationally analyzing and resolving the optimum trade-offs between potentially conflicting demands for usage of the Washington Park Arboretum.

Meanwhile, in the City's administrative organization, Mr. David Towne, Superintendent of the Park Department for the past several years, has resigned and has been replaced by Mr. Walter Hundley, a seasoned City administrator. A great deal was accomplished in City/University cooperation at the Arboretum under Mr. Towne's leadership and we are confident that the excellent progress of the past couple of years will continue under Mr. Hundley.

With these changes having taken place, it is clear that the Arboretum Foundation and other organizations will again have the opportunity to express their opinions and wishes regarding the Arboretum. Our priorities are well established, and I believe that they can and should be accomplished to enhance public interest in and usage of the Arboretum. The officers will undoubtedly be calling on many of you in the coming months to help present our story, and I would particularly appreciate your help in this effort in view of the long-range importance of the impending decisions.

Sincerely,

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COVER
Daphniphyllum macropodum,
male inflorescences.

Photo by Brian O. Mulligan
from a plant in his garden.
(See related article, p. 9)

Eucalyptus niphophila growing at the east end of the parking lot along the Broadmoor fence. Photo: Nancy Walz

THE FROST HARDINESS RESEARCH PROGRAM

W.H. HATHEWAY, H. KOHN and J.A. WITT*

Introduction

Testing plants for frost hardiness has always been an important responsibility of the University of Washington Arboretum. Until recently, however, the sophistication of techniques used have been limited by lack of research facilities. Records have been kept of the performance of all new accessions. When a plant suffers severe frost damage or dies, apparently from frost-related causes, these facts are noted in its dossier — usually an entry in a card file.

In the fall of 1975 a research program sponsored jointly by the Arboretum Foundation and the University was initiated to supplement traditional methods with modern experimental techniques. An introductory statement discussing program goals and techniques to be used appeared in the *Arboretum Bulletin* (Vol. 38, No. 4, Fall 1975). The present report is a follow-up of that paper.

Three basic goals were set for the year 1975-76:

1. Establishment of an efficient system for testing the frost hardiness of ornamental woody plants, particularly those with a reputation for being only half hardy.
2. Development of a modified research program based upon the results of the first season's work.
3. Formation of a group of volunteers from the Arboretum Foundation who would serve as an advisory board for the program and participate in the actual research work as well.

For our first year's work we selected as test plants:

Rhododendron 'Brocade,' a *R. williamsianum* hybrid of reasonable hardiness (RHS rating H^4, American to 0°F). Since the hardiness of the *Rhododendron* is well known and abundant material is available, we chose it as a control plant.

Taiwania cryptomerioides, a conifer related to *Cryptomeria* but endemic to Taiwan. Earlier introductions of this tree, despite the fact that it comes

*Dr. Hatheway is Professor of Quantitative Ecology, College of Forest Resources, University of Washington. Dr. Kohn is Associate Professor of Biology, Western Washington State College, Bellingham.

from high elevations above 6000 feet in the mountains of Taiwan, were winter-killed in 1950 and again in 1955.

Eucalyptus niphophila, Snow Gum, a native to alpine areas of Victoria and New South Wales in Australia. Several plants of this species have survived cold periods that killed or injured the majority of our *Eucalyptus* species. The largest tree was selected for testing.

Nothofagus dombeyi, a southern beech from Chile and Argentina with evergreen foliage. This has proved to be very hardy under Arboretum conditions and shows great promise as an outstanding ornamental.

Nothofagus solandri var. *cliffortioides*, another evergreen southern beech called Mountain Beech in its native New Zealand. This tree has not proved as hardy as its South American counterpart, but has survived outside since 1954.

Our principal objective in these studies was to gain some insight into the behavior of unfamiliar warm-temperate plants by comparing them with a well known cool-temperate variety like *Rhododendron* 'Brocade.' For example we were not sure how often we should gather materials for testing or how long into the spring the testing period should run. Moreover, we needed preliminary observations on these plants in order to develop useful research hypotheses for our subsequent intensive studies.

The object of much frost hardiness work is simply to determine the minimum temperature a plant can withstand once it has been suitably hardened. More thorough study shows how frost tolerance varies throughout the year. Our very hardy boreal and cool-temperate plants, for example, are susceptible to frost injury during much of the growing season. In late summer or early autumn they set their winter buds and gradually begin a sequence of internal changes that lead on the one hand to physiological inactivity (dormancy) and to increased frost tolerance on the other. It is assumed by many plant physiologists that if plants are to tolerate frost, they must be dormant, but this has never been conclusively demonstrated.

As temperatures drop during late fall and early winter, boreal and cool-temperate plants become increasingly resistant to low temperatures. Eventually winter gives way to spring, and as temperatures rise it is found that tolerance to extreme cold decreases. Once dormancy is completely broken and active growth has resumed, many boreal and cool-temperate plants become, as we have noted, susceptible to frost injury.

The seasonal behavior of warm-temperate and subtropical plants is less well understood. We know that they cannot withstand very low temperatures, but we do not know at what times of the year they enter dormancy or break it. The behavior of some plants which grow at very high elevations on snow-capped equatorial mountains provides some suggestive clues. Many botanists have found that these plants are able to withstand freezing weather at any time of the year. Presumably, unlike boreal species, they never become entirely dormant, but on the other hand their levels of physiological activity may always be relatively low.

We suspect that the behavior of warm-temperate (or subtropical) plants may be somewhat intermediate between these boreal and tropical alpine extremes. That is, during the winter they may become partially dormant and able to tolerate freezing temperatures, at least those that are not too low. The results of our first year's work have turned out to be consistent with those predictions.

Results of the 1975-76 Tests and Discussion

Test materials were collected in the Arboretum about every two to three weeks between October 3, 1975 and April 15, 1976. Materials were placed in moist polyethylene bags and stored approximately at constant temperatures in a styrofoam container for transport to Dr. Kohn's laboratory in Bellingham. There they were hung in a chest freezer equipped with controls that make it possible to lower temperatures accurately to predetermined levels for specified lengths of time (usually two hours at each temperature). After being subjected to freezing treatments, twigs were slowly brought to room temperature, placed in beakers of water and subsequently scored for tissue damage.

All plants investigated showed the expected seasonal variation in frost tolerance. A period of hardening during fall (October and November) led to a frost tolerance maximum between January and February with a subsequent decline in early-late spring. We found that the test plants fell within three groups according to the degree of frost tolerance they exhibited in midwinter. Fig. 1 shows this in graphic form.

Taiwania cryptomerioides

Group I (least hardy): *Nothofagus solandri* var. *cliffortioides*. In the course of the investigations, it became evident that this particular tree was behaving differently from all other species. The untreated leaves started to show symptoms of yellowing (chlorosis) and lost even more of their green pigmentation throughout the experiment. Even under optimum conditions (warm, humid and lighted) specimens deteriorated substantially and generally died if kept longer than 45 days. It is not surprising, therefore, that the freezing experiments revealed such a low level of frost tolerance.

Group II (moderately hardy): *Nothofagus dombeyi, Eucalyptus niphophila*. During the period from December through the beginning of March, these two species exhibited a moderate frost tolerance of between −12°C (10°F) and −14°C (7°F). They were never in any danger of being injured since the lowest measured temperature in the Arboretum was only −6°C (21°F). However, a certain degree of tolerance fluctuation is noticeable.

Since these fluctuations seem to be characteristic of this group, further experimentation will be carried out to determine the cause. At least two explanations of this phenomenon are possible:

1. The fluctuations may be genuine tolerance adjustments of the whole organism to the moderate fluctuations in winter temperatures during this midwinter period. Several warm periods followed by brief cold spells may have induced dehardening and hardening processes. Artificial dehardening and hardening treatments or much more frequent testing, especially before, during and after cold or warm weather periods, would be needed to demonstrate frost tolerance instability in these species during midwinter.

2. Samples removed at random from different branches of the two trees may be rather stable in their tolerance throughout midwinter, but may have developed different levels of frost hardiness because of their differing exposures. This obviously could affect the experimentally observed variations in frost hardiness values from one testing period to the next. Moreover, variations in tolerance of branches with different north-south exposures is to be expected if the tree has not hardened to the fullest extent because of mild weather conditions. If such a lability of frost hardiness is characteristic of the species, it may be subject to serious frost injury in cool-temperate climates.

Group III (most hardy): *Taiwania cryptomerioides, Rhododendron* 'Brocade.' These two species demonstrated a relatively high frost hardiness level throughout midwinter. The *Rhododendron* attained a frost tolerance of −18°C (0.4°F). This would enable it to withstand most severe winters experienced in the Seattle area. *Taiwania,* which is slightly less tolerant (−16.5°C or 2°F), parallels the tolerance curve of

the *Rhododendron* rather well.

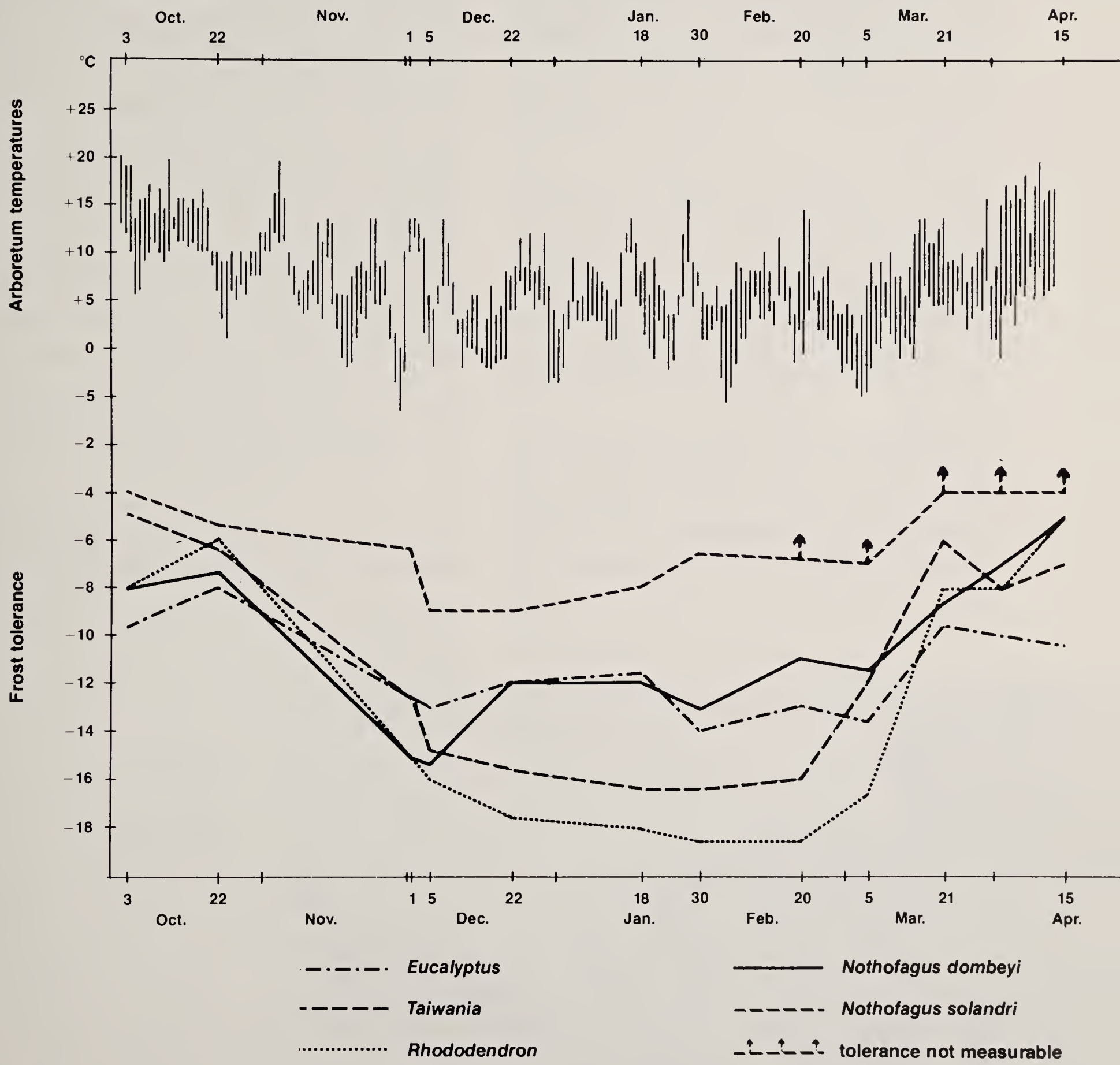
In contrast to Group I, the Group II species exhibited a rather high degree of stability in their tolerance. Noteworthy was a sudden, marked decrease in frost tolerance at the end of February and beginning of March when environmental temperatures were still relatively low (−5°C or 23°F on March 4).

Differences among the three groups were not obvious during early fall (October) or spring (March and April). These are generally periods when the frost tolerance of plants is in a state of flux. Complex physiological changes are taking place that are not yet well understood. The plants seem to be responding to environmental cues — probably temperature or length of day or some combination of both.

Identification of environmental factors which influence physiological changes in plants is not an easy task. Such work usually involves the use of controlled environment facilities (growth chambers) in which plant responses to controlled variation of one or more environmental variables, such as temperature, are carefully measured.

The plants investigated in autumn 1975 were either still at their minimum level of tolerance or

Fig. 1. Top: Arboretum temperatures, winter 1975-76. Bottom: Tolerance curves of the five species tested.*



*Dates indicate times when tests were made.

Graphics: Sally Dickman

had already started the hardening process. The temperatures in September were relatively high (max. 30°C or 86°F), but dropped somewhat in the last third of the month. Night temperatures during that period fluctuated between 6°C (43°F) and 10°C (50°F). These are conditions which are known to stimulate the hardening process if plants are physiologically prepared for it. Three of the plants studied, *Eucalyptus niphophila, Nothofagus dombeyi* and *Rhododendron* 'Brocade' hardened in this first phase; the *Eucalyptus* became tolerant to temperatures as low as −9.5°C (15°F).

Taiwania cryptomerioides which belonged to the most hardy group in midwinter, was extremely sensitive to frost at this time. On October 3, this plant was not yet prepared to withstand any appreciable amount of ice formation. Its condition, however, improved somewhat in the following 20 days. It tolerated −6°C (21°F) at the next test on October 22 despite the fact that the weather conditions were very mild — temperatures varied between 10°C (50°F) and 20°C (68°F). This seems to indicate that factors other than temperature such as day length stimulate *Taiwania* to initiate the hardening process. In contrast to *Taiwania,* the three less hardy species mentioned above, those in Groups I and II, seem to respond to warm temperatures by decrease of their tolerance by about 2°C.

In late winter and early spring plants are especially endangered by late frosts. Rapid loss of tolerance at this time may lead to the plant's injury or death. At this phase of decrease in frost hardiness, plants often show differences in tolerances. *Nothofagus dombeyi,* for example, lost its tolerance rather steadily beginning in March. It seems to be unable to arrest the dehardening process once that has been initiated. In other words, its tolerance marches inexorably toward its summer minimum, regardless of prevailing environmental temperatures.

Other plants are known to have the capacity to slow the dehardening process or even to rehardden should cold spells interrupt the warming trend of spring. The *Rhododendron, Taiwania* and especially the *Eucalyptus* seem to belong to this group. In late spring *E. niphophila* retains an unusual level of hardiness (−10.5°C or 13°F). It will be very interesting to examine the further decline of tolerance in this species, if there is one. It should be recalled that *Eucalyptus* had the highest tolerance (−9.5°C or 15°F) on October 3, which leads us to speculate that the summer mimimum may very well be rather close to this value. This surely should be considered an exception to the general rule that the summer tolerance for plants is usually between −4°C (25°F) and −6°C (21°F).

These results will cause few surprises among experienced gardeners in our area. Perhaps *Taiwania* has turned out to be somewhat hardier than many would have expected. The behavior of the other plants is entirely consistent with our experience with these taxa in the Arboretum. To the practical gardener it would appear that this year's results have little direct value, but offer much promise for the future. This promise lies largely in two directions: (1) early testing of proposed new introductions to the Seattle area;

Nothofagus dombeyi

Photo: Nancy Walz

(2) improved cultural techniques for marginally hardy taxa already under cultivation here.

Continuing projects

Equipment acquisition

Having worked out routine testing procedures during the first year of our program, we plan to expand our activities considerably in subsequent years. Accordingly, we have acquired additional equipment. Early in 1976 we purchased two freezers which had been declared surplus property by the University of Washington School of Medicine. Professor Kohn has now constructed temperature control equipment for these freezers. More recently we acquired six additional freezers, which will be located in Bellingham until space becomes available in Seattle. This battery of eight freezers will allow Dr. Kohn and his assistants to study much more material and to arrange more efficient work schedules.

The ninth freezer will be installed in Seattle early in 1977, where we will use it to test the hardiness of a number of plants during the coldest part of the year. These "single point" studies will tell us, to a reasonable degree of approximation, the coldest temperatures our test plants can endure but will not tell us how hardiness varies throughout the year. During the cold season, however, we should be able to "single point" test perhaps 20 taxa with our Seattle freezer.

Seeding tests

The long-term objective of the Arboretum's frost hardiness program is to test potential Arboretum introductions for frost hardiness. Accordingly, we regard this program as a large-scale continuing enterprise in which within a few years perhaps 50 to 100 new introductions will be tested annually. Since plants are most conveniently brought to Seattle as seeds, early testing should be done on seedlings if this is feasible. For example, the Arboretum may wish to acquire enough seeds of every taxon proposed for introduction to allow for seedling frost hardiness testing. If on the basis of seedling tests a taxon turns out to be not sufficiently hardy, it can be discarded before excessive effort is wasted on it.

Unfortunately, seedling hardiness is not a perfect predictor of mature plant performance. Much of the work in the 1976-77 testing season has as its object clarification of the relationships between frost tolerance of seedlings and of mature plants of the same species. During the summer of 1976 we grew seedlings of *Eucalyptus niphophila, Tsuga chinensis, Taiwania cryptomerioides* and a few other evergreen taxa. In the autumn-winter-spring testing we began to compare the frost tolerance of these seedlings with twigs of mature plants of the same species.

Miniaturization

The twigs of many ornamental plants are inconveniently bulky for testing. Moreover, removal of entire shoots of large-leaved plants such as those of many Rhododendrons of the Falconeri Series would represent serious setbacks to their development. In such cases it may be possible to test single leaves or even portions of leaves. During the 1976-77 testing season we began comparisons of twigs and individual leaves of Rhododendron varieties.

Proposed studies on tropical plants

Many plants of high elevations in the tropics are surprisingly hardy when grown in Seattle. For example, *Pernettya coriacea* and *Gaultheria donnellii,* of the high mountains of Costa Rica, have been grown for a number of years in Seattle gardens. We have only begun to investigate the possibility of such introductions.

Dr. Hatheway has recently completed a research proposal to the National Science Foundation, which he prepared in collaboration with Dr. David M. Gates of the University of Michigan, to study certain aspects of the physiological ecology of the giant rosette plants of Mt. Kenya in equatorial Africa. These bizarre *Senecios* and *Lobelias* are subjected to temperatures as low as −5°C (21°F) most nights of the year. Professor Gates, who was formerly Director of the Missouri Botanical Garden, is well-known for his work on photosynthesis, transpiration and the energy budgets of plants. If the proposed new work is funded, Drs. Gates and Hatheway will travel to Kenya in early 1978. In subsequent years they hope to continue further studies in the Andes of Venezuela, Colombia and Ecuador.

Leaf temperature models

Dr. Gates has developed mathematical models which enable him to predict the temperature of

leaves if certain meteorological data are known. In 1977 Dr. Hatheway plans to apply these models to representative Seattle environments. They should enable us to answer questions such as precisely how different are north- and south-facing sides of houses during the winter months. Drs. Walker and Hatheway will compare model-predictions with actual measurements of leaf temperatures in several Arboretum environments.

Volunteer Program

A group of twelve volunteers[1] met several times with Professors Hatheway, Witt, Walker and Kohn. A series of four orientation lectures gave the volunteers an overview of the objectives of the research program, the physiology of frost hardiness, the Arboretum's climate and its implications for frost hardiness work, and laboratory techniques for determination of frost hardiness. There followed a number of discussions addressed to the organization of future work.

[1]Marian Addison, Lee Clarke, Marjorie Clausing, Irene Christofferson, Louise Czerniski, Diggs Docter, Cora Gardiner, Jeanne Gardiner, Shirley Keith, Helen Moodie, Diane Morgan, Doris Taggert

We originally had hoped that much of the second year's laboratory work might be carried out by the volunteer group, but we now feel that this is impractical for two principal reasons: (1) the Arboretum is unable at present to provide work space for a program of the scope we had envisaged; (2) a considerable part of the work must be done at very inconvenient hours. We have therefore decided to continue to concentrate our laboratory studies in Bellingham using students as hourly helpers. The volunteer group will assist in providing materials, especially seedlings, of plants we wish to test.

They have also agreed to take on what promises to be an even more significant role, that of functioning as an advisory board to the hardiness program. The work we propose to carry out in the second year has been thoroughly discussed with our board, and they have made a number of very helpful suggestions. We feel that frequent meetings with this board serve to keep us aware of the needs and wishes of Arboretum Foundation members and provide a most useful means of maintaining close contact with the Board of Directors of the Foundation and its Executive Committee. When research space becomes available, we hope we will be able to enlarge our volunteer program significantly. ♠

THE WINTER OF 1976-77 has been beautiful for its fair weather and frightening because of the drought. At the present writing (February) gardeners are beginning to worry about helping their plants to survive the water shortage that faces us this summer. Many of us are on municipal water systems which may be forced to impose water rationing. Others are dependent on wells which may quite possibly run dry.

If the drought continues into the spring, the *Bulletin* plans to have an article, or perhaps a forum, on methods of combatting this threat. Suggestions we have heard discussed so far are: water now if your plants are dry; apply a protective mulch to garden beds; avoid transplanting large plants because they will suffer more from water stress than their well-established neighbors. But other questions remain for the experts to answer. Should we reduce fertilizing? Should we prune to cut down on transpiration; if so, when and how much? What is the most effective way of applying the limited water that will be available to us?

Have our readers suggestions to share with fellow gardeners? The *Bulletin* would be interested in hearing from you. We only hope that the advice we can offer will not be too little too late.

THE EDITOR

Photo: Brian O. Mulligan

Vaccinium stamineum **flowering at Arboretum des Barres, France. June 1973.**

From A Collector's Notebook

BRIAN O. MULLIGAN

1. *Vaccinium stamineum*

The deerberry of the eastern United States is not seen in cultivation outside its native area as often as it deserves. It is found wild from Massachusetts to Minnesota, south to Louisiana and Florida. Habitats mentioned in local floras include dry woods, upland slopes and glades, and woodland clearings. In the south it flowers in April and farther north in June; its fruits appear from June to September respectively.

Vaccinium stamineum can grow in nature as much as ten feet high, but cultivated plants rarely exceed three to four feet. The branches spread and overlap one another so that the width may be as much as or more than the height. The leaves are thin-textured, the underside glaucous with distinctly raised veins. They are ovate-lanceolate in shape, acute at the tip. Quite variable in size, they range from 1.5 to 2.5 inches long, the largest ones occurring towards the tip of the shoot.

The flowers, in leafy racemes, resemble those of *Styrax japonica* in miniature, with five spreading white, greenish or purplish lobes and exserted stamens and styles. They are not at all like the usual bell- or urn-shaped flowers of most *Vaccinium* species. On older plants they can be produced in large quantities making an unusual and effective display. The fruits vary in color from green to purple and are edible, though not highly recommended by any authority consulted.

The photograph was made June 12, 1973 of a very large old plant in the Fruticetum at the Arboretum des Barres, Loiret, France. Since the species is listed in the 1906 catalogue of plants cultivated in that Arboretum when it was owned by Maurice L. de Vilmorin, it is quite possible that this is the same individual, now aged about 70 years. It also grows in our Arboretum in Seattle.

2. *Daphniphyllum macropodum*

In a region such as the Pacific Northwest where broad-leaved rhododendrons are so frequently grown in many gardens, it is sometimes surprising to come across a large evergreen shrub with handsome foliage carried on long red stalks that is not a rhododendron, although in the absence of flowers this fact may not always be realized or its identity recognized. The shrub in question is *Daphniphyllum macropodum.*

In the central and southern regions of its native Japan, it is capable of becoming a small tree 30 to 40 feet in height. In northern Japan and southern

Korea a shrubby type, var. *humile,* is found as undergrowth in deciduous forests and might be expected from its range and smaller size to be hardier than the normal type. A variegated form is occasionally seen whose leaves have creamy white margins.

Daphniphyllum macropodum was introduced by Charles Maries to England in 1879; hence it has been in cultivation in western gardens for almost a century. At Kew Gardens, it is recorded as having endured a temperature of 2°F; it has never been injured in any recent winters at the Arboretum.

Being a member of the spurge family, Euphorbiaceae, it bears no resemblance to the rhododendrons (Ericaceae) in characters of flowers and fruits. Futhermore, the plants are dioecious (having male and female flowers on different plants). Since they also lack petals, only the reddish coloring of the bracts surrounding the flowers makes them at all conspicuous.

However, it is for its effect as a foliage shrub that it should be grown. The leaves are six to eight inches long, one and one-half to two and three-quarters inches wide, thick and tough, dark green on the upper side, but much paler beneath, in fact almost glaucous in some individuals. They have 10 to 12 pairs of veins, the midrib prominently raised beneath, the laterals joined by a noticeable network of veinlets. Perhaps the most conspicuous feature is the stout red petiole, one and one-half to one and three-quarters inches long, which no doubt accounted for the Greek specific name *macropodum,* meaning literally "large foot." This coloring may continue into the midrib at the base of the leaf, which is wedge-shaped. These features of the leaves differ from those of any rhododendron with which I am acquainted, except perhaps for their size, which is comparable, for example, to those of *Rhododendron discolor.* The terminal reddish bud of the shoot with its small filiform bracts is also very distinctive.

The single specimen in the Arboretum (of unknown origin) was planted in November 1957 down the hillside to the west of the holly collection. It is still there, but has only grown to nine feet in height because of severe competition from surrounding plants of salal (*Gaultheria shallon*) and thimbleberry (*Rubus parviflorus*), as well as the native big leaf maples (*Acer macrophyllum*). This plant, which is female, has flowered several times in April or May, but until a male plant is introduced we shall not see the interesting blue-black, pea-sized fruits.

To anyone who may be considering planting a *Daphniphyllum* it would be well to allow it plenty of space, since it can grow almost as wide as high if not restricted or regularly pruned. ♠

A New Direction

On Monday, January 10, 1977, a joint committee, the Arboretum and Botanical Garden Committee, composed of representatives from the City of Seattle, the University of Washington and the State of Washington, after evaluating and interviewing numerous proposals, selected Jones & Jones, Architects and Landscape Architects, to update the Master Plan for the University of Washington Arboretum in Washington Park. This project, part of the University's continuing effort to improve its arboretum program, will require six months to complete.

Jones & Jones is reviewing all existing records, particularly the original Olmsted Brothers plans, gathering site-specific data, and discussing goals/policies/concerns with all interested groups and agencies. A detailed analysis process will yield a list of proposed uses/activities appropriate to the site and program. The synthesis of all these variables will produce a draft plan for public review, with detailed recommendations for the resolution of existing conflicts and avoidance of future ones. The final Master Plan will include graphic and written concepts on architecture, roads, landscape details and signs; concept-designs for all new use areas, new features or other major changes; implementation, scheduling and management of the master plan and identification of future study needs.

JONES & JONES
ARCHITECTS AND LANDSCAPE ARCHITECTS

A Master Plan for Union Bay

The final Master Plan for the Union Bay Teaching and Research Arboretum was formally transmitted to the University of Washington by Jones & Jones, Architects and Landscape Architects, on October 27, 1976. In the intervening months, the stage has been set to proceed with implementation of the plan. While no formal schedule exists as yet, enthusiasm for it is high at all levels.

The four major aspects of the University of Washington Arboretum program are, of course, teaching, research, public service and display, and stewardship. Historically, research activities in the plant sciences have suffered from a lack of facilities at the University, a deficiency made more noticeable by the increasing maturity of the collections at the University of Washington Arboretum in Washington Park.

As these stands and individuals mature, there will be numerous opportunities for experimentation on growth rates, interspecific hybridization, frost hardiness, genetic control mechanisms, nutrient cycling, floristic variation, resistance to pathogens and insects . . . the potential list is limited only by available funding. These areas of research require extensive laboratory, library and administrative support facilities that are currently dispersed, unavailable on a routine basis or simply lacking.

The Union Bay Teaching and Research Arboretum is specifically oriented to alleviate this problem. Facilities for laboratory research will be designed to complement and extend those currently available in the College of Forest Resources and the Botany Department. A library will, for the first time, allow the complete research collection of the Arboretum to be removed from storage and made readily available to those interested. Finally there will be adequate administrative facilities and storage space, provisions for seminars and an herbarium. Concentration of effort will yield synergetic results.

The Master Plan for the Union Bay Teaching and Research Arboretum details the potential role of that facility in the overall Arboretum program. Copies of the plan are available at the Offices of the University of Washington Arboretum in Washington Park until the supply is exhausted.

JONES & JONES
ARCHITECTS AND LANDSCAPE ARCHITECTS

The Arboretum: A Living Laboratory

*CONNIE MILLAR**

". . . The Arboretum must be viable . . . the Arboretum must be dynamic, offering programs, new programs and repeat programs, to share the knowledge that we have accumulated . . ." Francis Ching, Director, Los Angeles State and County Arboretum.[1]

Have you ever noticed on a bright sunny day or a drizzly autumn afternoon a group of college age people huddled detective-like around a tree in the Arboretum? If so, this group probably belonged to one of several classes from the University of Washington which uses the Arboretum as its field laboratory. Indeed, it was just such a sight on an early spring day five years ago which convinced me — then a high-school senior — that the University of Washington was the only school for me. Little did I realize that within three years I myself would be leading similar groups around the Arboretum.

On weekday afternoons throughout autumn and spring, students and instructors spend three or four hours, sometimes walking all the way from Foster's Island to the Japanese Tea Garden to study the Arboretum collections. Although you will usually see small groups at a time, each quarter approximately 200 students spend at least one afternoon weekly in the Arboretum.

Arboretum Users from the University

Several departments at the University of Washington offer classes directly or indirectly involving Arboretum study. Probably the heaviest use comes from the College of Forest Resources in which two of its core-curriculum classes bring approximately 150 students nearly every week in autumn and spring to the Arboretum. One of these, the course in Dendrology (biology and identification of tree species), comes alive through use of Arboretum resources. The Dendrology professors, Drs. Linda Brubaker and Reinhard Stettler, are convinced that the three-hour weekly lab exercises in the Arboretum present unique opportunities for studying the tree species as live specimens. Because most of the descriptive taxonomy is covered during these lab exercises, more time is available in classroom lectures to deal with conceptual material on the systematics, ecology and genetics of forest trees.

The structure of the Arboretum exercises is straightforward. Prior to each visit, students study a list of 12 to 15 species of trees they will observe that week. Students meet on appointed lab days at the Arboretum administration buildings, where they separate into two groups, each group headed by the professor or by a teaching assistant, and they head for opposite ends of the study area. Since the species lists are arranged taxonomically by genera and families, the groups must often walk the entire span of the Arboretum — in and out of the woods — to cover the complete list. Because of the wide extent of the Arboretum's collections, a large sample of species from native families can be studied in detail during one term.

The philosophy of learning in the Arboretum is one of discovery by the students rather than instruction by the leader. Approaching each tree as an unknown specimen, students try to identify it themselves instead of passively observing. They use dichotomous keys, refer to descriptive texts or to notes which they have taken on previous specimens. Bit by bit they narrow down the iden-

*Connie Millar will earn her undergraduate degree in the College of Forest Resources this summer. Since she has also been a teaching assistant for the class in Dendrology, which she describes in the accompanying article, she is well qualified to write from the points of view both of the student and the instructor.

[1]Excerpt from: Proceedings of a Symposium: The Urban Arboretum in a Time of Crisis. 1972. University of Washington Arboretum Foundation.

tification to family, to genus and finally to the species level.

The Dendrology instructors have found that this approach — coined the "Aha! Approach" — leads to greater involvement on the part of the student, and increased learning from firsthand experience. In addition, there is something in human nature which makes discovery for oneself a special event, regardless of the fact that the same discovery has been made by countless other persons before. It is the same attractive force which accounts for much that is intriguing in scientific research.

It stands to reason, however, that this teaching method is viable only if students have sufficient prior knowledge and preparation to tackle the problem. The instructor's responsibility is to supplement and build upon students' knowledge so that they arrive at the point where this approach is beneficial as well as feasible.

After the students have identified (or nearly so) the species in question, the instructor takes five to ten minutes to summarize the important descriptive characteristics and to point out diagnostic "tricks" useful in distinguishing look-alike species. The discussion then turns to the broader aspects of the species — its range, ecology, adaptive features, and wood and foliar properties and uses.

The use of the Arboretum for lab classes in Dendrology has a long history at the College of Forest Resources. Dr. David Thomas first started taking his students there in 1946. But this tradition of studying trees in lab exercises is not the only way in which the Arboretum is used by the Dendrology class. An important aspect of this course is a term project requiring the students to research particular aspects of a species or several species. In executing a mini-scientific research program they are able to learn a great deal more about a species than can be presented in lecture or laboratory exercises. Because of its proximity to the University and the unique conditions available in the Arboretum, many students choose Arboretum trees as the subjects for their reports.

Projects range from construction of audio-visual programs which convey the descriptive, ecological and unique properties of a species, to quantitative, comparative studies of form and function in the different foliar and crown geometries of species; from springtime pollination ecology studies where the adaptive structures of inflorescences are observed in relation to insect pollinators, to autumnal herbaria of fruit and leaves. In pursuing their research, students often spend weekend days in the Arboretum — photographing, measuring, patiently (or impatiently!) awaiting pollination visitors or climbing around the trees, ruler and notebook in hand.

Dendrology is not the only course in the College of Forest Resources which utilizes the Arboretum.

Dr. Brubaker discussing a species of pine with her Dendrology class.

Photo: Joseph W. Marshall

Photo: Joseph W. Marshall

A student examines a branch of incense cedar — touching, feeling and smelling to identify it exactly.

The Forest Surveying class relies heavily on the Arboretum as the setting for its four-hour weekly field exercises. A skills class by nature, learning the techniques of forest surveying necessitates practicing with instruments in a woody environment. Although formerly field exercises were conducted primarily at Woodland Park, current professor, Dr. Peter Schiess, enthusiastically prefers the Arboretum because of its diversity of terrain and its hilly, naturally wooded areas which more nearly simulate forest conditions than Woodland Park. The broad, flat expanses are best for novice tape and compass work, whereas the uncultivated hills in other parts of the Arboretum serve as sites for practicing the more difficult techniques required for slope measurement and contour map construction. Because of these advantages, and the proximity of the Arboretum, Dr. Schiess now uses the Arboretum exclusively.

Besides the College of Forest Resources, the University's Botany Department also offers classes in which the Arboretum is an essential ingredient. The Ornamental Plants class, taught every spring and summer by Dr. Arthur Kruckeberg, is a required course for all Landscape Architecture students as well as being a popular course in the Botany Department itself. Whereas the forestry classes pay special attention to roles which tree species play in wild environments, the ornamental botany class studies trees and shrubs which have proven (or potentially may be) aesthetically and physically suited for horticultural use.

The Arboretum is one of several places which the students of ornamentals visit; the others are the Government Locks, the University of Washington campus and selected private gardens. Such variety is important, stresses Dr. Kruckeberg, in order for students to understand the many ways that planting can be used around human habitation. The main emphasis during field trips is on the taxonomy and systematics of selected species and their horticultural uses and requirements. Like the Dendrology class, students prepare a term project, the completion of which often requires research and study of particular species or specimens in the Arboretum.

These three classes represent the primary University users of the Arboretum. Many other classes also use it regularly but in lesser frequency. Classes in introductory Biology, Plant Taxonomy, Photography, introductory Forest Biology and Environmental Sciences are among those whose course outlines have included at least one visit per term to the Arboretum. To each class, the Arboretum's diverse resources have offered unique opportunities for study.

Benefits of the Arboretum — What Do the Students Say?

It should be clear by now that the Arboretum has traditionally been used by generations of University students through new and repeated programs. What are the factors that have made the Arboretum so popular as an outdoor laboratory?

The many native and landscaped sites, complete with such a large number of native and exotic species, offer variety for those who wish to study plants. The fact that many species are represented by more than one specimen helps the students to understand the tremendous morphological variation which exists in nature.

Although set in the middle of urban Seattle, the Arboretum is large enough that one feels distant from the surrounding city even though a short drive away from the University. Probably most

Students from the Forest Surveying class squint through a transit, watching for the flagman on Azalea Way. Photo: Connie Millar

important is the fact that the Arboretum presents a unique total environment. In addition its proximity offers an escape from the conventional lab classroom. Away from long-conditioned tensions associated with a campus environment, students feel more relaxed and more in touch with the forest setting. Away from bells and distractions, students seem less time-conscious and more pre-disposed to the program of study.

Arboretum use establishes a physical contact between classroom studies and the forest environment. For many who have struggled for two years through lower division non-Forestry or non-Botany related requirements, the Arboretum-centered courses represent the first tangible step toward the discipline which they wish to study.

In the less formal atmosphere of Arboretum classes, students and instructors have a chance to become well acquainted — a change from the anonymity which haunts large universities. Because students come from such diverse backgrounds, they often have had varied experiences in and with plants. During Arboretum exercises, there is an opportunity to share with one another the knowledge they have accumulated. Frequently, anecdotes bring up new and fascinating bits of information from which everyone gains. Such verbalization of personal experiences serves to involve many students in the learning process in a manner which is nearly impossible in a classroom situation.

Many students have expressed pleasure in the weekly routine of visiting the Arboretum. Despite the cold and the rain, they derive a sense of serenity in experiencing its phenological changes. He who marks time by observing intimately the slow and solumn march of winter or the vibrant blossoming of spring surely participates more intensely in the changing seasons than one who is classroom-bound. Weekly visits provide the opportunity to watch changes that other, infrequent visitors may not see — the blazing and lingering red of the *Nyssa sylvatica* off lower Azalea Way, the long retention of leaves on the red alders by the lagoon, the manner in which the wind and rain whip the last leaves from the Pacific dogwood. These experiences are non-trivial, for they foster a keener sense of observation requisite to all biological inquiry.

If it seems obvious to state these benefits of the Arboretum to University students, then you, as I have taken the existence of the Arboretum for granted. In a survey I conducted recently of other forestry schools, I discovered that often dendrology and plant classification courses are taught without using an arboretum laboratory. Actually, many top-ranking forestry schools either have no arboretum available or lack one of useful size and breadth. For the most part, at these schools students learn to identify trees through the use of herbarium sheets, Reiker mounts, photographic slides or living boughs and fruits brought indoors to the classroom. The only exposure they have to live trees comes during one or two field trips per term to distant forests.[2]

Of course, it is difficult or impossible to evaluate the superiority of either program in the long run, but in my opinion — and in that of many students here — an arboretum offers the most balanced and varied environment for a diversity of field botany pursuits, and is best suited for the type of interests to which the University caters.

Nevertheless, you need not take my word as truth. Come out and join us in the Arboretum as we prepare for another lab outdoors. Be ready to investigate, to discover, to get cold fingers and wet feet, and most of all be ready to share what you know. But be careful! You too could end up like a University student, notebook and pencil in hand.

Acknowledgement

I should like to thank Linda Brubaker for her patient help with the original manuscript.

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[2]Notwithstanding the innovative programs at some schools: Bever, Dale. 1974. 'Dendro,' an Unstructured Approach. Journal of Forestry 72:6-12.

The Arboretum serves people in many ways.
Work and Fun Day — April 14
is your opportunity to serve the Arboretum.

You Can Get Here From There

GWEN BELL*

Mae Granston's search for property to develop into a rhododendron garden began when windowsills and tables were packed to overflowing with pans of seedling rhododendrons. Her 100 by 300 foot city lot was jammed with plants. The need for growing space became desperate when she compounded her dilemma by enrolling in a cutting and seed class at the Arboretum Unit Council Patricia Calvert Greenhouse. She was 56 years old and a widow with grown children. Admiration for Elizabeth Blackford who had begun her outstanding garden on Mercer Island some years earlier, also at age 56, inspired and encouraged her to believe that she, too, could establish a very special garden.

*The *Bulletin* welcomes another sprightly offering by Gwen Bell, who has previously contributed two articles on Rhododendrons: "Hybridizing, Part II," Vol 37, Fall 1974; "The Shotgun Approach to Hybridizing," Vol. 38, Winter 1975.

Looking down into the garden from the cabin porch. Photo: Nancy Walz

She formulated the following checklist of requirements that constituted the basis for her search:

1. Three to five acres of good soil
2. A stream (the original dream of channeling it into a series of waterfalls was eventually abandoned)
3. Good water available for irrigating
4. Isolation from schools and power lines
5. Large conifers growing on the property

Her investigation ranged through King and Snohomish Counties and occasionally as far as Hood Canal. All clippings of classified ads, photos, written information, costs and her own evaluation of each property checked went into a notebook. Looking at that notebook makes interesting reading today.

In 1967, after one and one-half years' search, she pointed to a Bothell street map on the wall of a realtor's office and conjectured that there ought to be something suitable in that area where there were numerous streams and creeks. The realtor replied that there was one parcel of land for sale but it encompassed almost 18 acres. As Mae Granston approached this acreage she saw tall trees and a tangle of salal and ferns that made the site almost impenetrable. The property, running lengthwise east to west, was bisected by Bear Creek, a rippling salmon stream. East of the creek was pastureland but the front, western half of the property, was forest with an understory of wildly growing groundcovers. The soil appeared to be excellent. Because the wooded portion fulfilled so many of her requirements, she negotiated to buy this part. The owner refused any division of the acreage. On January 12, 1967 Mae Granston

purchased the entire parcel. From the beginning it became known as "The Farm."

Exploring the terrain, marking the finest trees to save, she found tall firs, some cedar, hemlock and alder. Understory plants were salal, dwarf mahonia, sword fern, lady fern and isolated colonies of pyrolla and pipsissewa. Trailing wild blackberries sent her sprawling more than once. Wild red huckleberry, trillium, vine maple, deer ferns and piggyback plants from huge patches near the creek have provided attractive material for annual Arboretum Foundation plant sales.

On the south side of the property where the land slopes off toward the creek, there was an alder swamp with water standing 12 inches below the surface.

In the center of the wooded area stood a disintegrating cabin built in 1931 which has become the bonus of the venture. With some refurbishing this one-room house was to provide cooking, washing and rest facilities, the means to spend all day or overnight on the premises.

The first challenge in developing The Farm was to clear and widen the overgrown track winding into the center of the woods. The next was to drill for water, which they found at 31 feet. A survey was made in 1968.

Logging and thinning began that year, an essential operation since new woodland gardens suffer severely from lack of light. It was painful to hear each giant evergreen crash. More forest was thinned, more stumps removed. As space was cleared, after rototilling, roll after roll of black plastic was laid down to prevent germination of annual weeds. The logging left behind so much debris that burning was the only way to dispose of it. Fortunately burning was not illegal in this rural area.

Gradually areas suitable for planting emerged to light, air and rainfall. This one-woman dynamo, with occasional help from her busy sons, hauled approximately 30 station-wagon loads of plants, plus one truckload. These had been grown from seed and cuttings, purchased at nurseries or selected from choice material offered at Arboretum Foundation plant sales. It was no small triumph when she could stand on her cabin porch, look down through the trees and see gently sloping paths curving around beds of healthy young rhododendrons.

In 1970 a pond was dredged. The more Mae had pondered over the alder swamp, the more vividly she could see the potential for a lovely pond, its surface reflecting brilliant colors from drifts of azaleas naturalized along its shore, with perhaps a small island in its center. The pond was stocked with 400 trout but the blue heron winged in and eventually stole them all. Now bull frogs dive into the water, boom their full-throated croaks from their secret places while shining blue dragon flies dance and swoop above the water.

Footbridges were built from shore to island to farther shore. Although fishing from them will never give her grandchildren pleasure, these footbridges have become a delight. They lead to a rustic picnic shelter built on the island in 1976 — a shake-covered open-sided hut which protects two picnic tables. Here the Arboretum Unit Council Rhododendron Study Group voted to rename itself after Mae Granston.

A two-car garage and attached workshop were constructed opposite the house in 1970, providing storage for tools, implements and a tractor. In the workshop a wood stove supplies winter heat. A 14 by 30 foot greenhouse, attached to the rear of the workshop, has three benches full of cuttings,

View of the greenhouse from the east. Fresh stumps in the foreground are evidence of the thinning that is still in progress to let in more light. Photo: Nancy Walz

R. spinuliferum (Scabrifolium Series) grew outside in the Seattle garden. At The Farm it requires more shelter. Photo: Jerri Fredin

A Potpourri o

Mae Gra

In the Greenhouse

R. laetum (above) and *R. lochae* × *aurigeranum* (right), both members of the Vireya section from Southeast Asia. Photos: Mae Granston

R. cubittii, the best of the Maddenii Series — rare, and overwhelmingly fragrant. Photo: Mae Granston

Rhododendrons

ston Grows

In the Garden

R. 'Naomi Stella Maris,' one of the magnificent hybrids from Exbury. Photo: Mae Granston

R. chamae-thomsonii (Neriiflorum Series), with netting covering the flowers that have been hand-pollinated. Photo: Mae Granston

R. prunifolium, a lesser known azalea from south-eastern United States, it blooms in July and August. Photo: Mae Granston

Azaleadendron 'Oregon Queen,' the Arboretum's award-winning plant of this natural cross between our natives *R. macrophyllum* and *R. occidentale.* Mae grows this also and believes that it should be in every Northwest garden. She says that cuttings strike 100 per cent. Photo: Jerri Fredin

The pond, with footbridges and picnic shelter. Photo: Nancy Walz

seedlings and plants sensitive to low temperatures. A woodshed and fiberglass shade house complete this working complex.

In 1976 after four summers of work, a college student completed more than a thousand feet of rail fence, built almost entirely of material available on The Farm. Many of the posts and rails were peeled by Mae during the winter months.

Perhaps the most frustrating project has been the acquisition of a right-of-way to the east property beyond Bear Creek and the construction of a bridge across it. A ten-foot strip was purchased, out of necessity, from the neighbor to the south after it was learned during the survey that this selfsame land had been fenced off her property many years before and now legally belonged to the neighboring farm. Construction of the bridge itself was initially a fiasco when the builder's truck was repossessed and he pulled out of the half-finished job. Eventually Mae's children rented equipment and were able to complete the bridge in 1975. It is a handsome structure that offers a new perspective on the beauty of the creek and the surrounding forest.

Development of a garden in one of the less populated areas of the county brings its own problems. Nursery beds are threatened by rabbits, deer and mountain beaver which dearly love to feast upon the tender new shoots of rhododendrons. Wire fencing of the nursery beds ensures their survival. From time to time the neighbor's cows have created havoc by breaking down old sections of fence and trampling over rows of flats, mixing labels and snapping off stems and branches. Power outages particularly in winter months cause concern for the delicate plants in the greenhouse; The Farm is located in one of the colder areas of the Puget Sound region. Limbing has helped to reduce the number of huge branches which might be blown down by winter winds or broken by clinging wet snow.

One of the most nagging obstacles has been recurring breakdowns of her indispensible tractor. On two successive summers the machine has been out of commission for weeks, even months, because of the difficulty in obtaining parts. One young helper was so inept at handling it that he turned the tractor over on flat ground in front of the garage.

Good weeders are hard to find. The use of black plastic in new beds has helped to reduce the problem. Casoron has been invaluable in controlling weeds in established beds and the use of Monobar Chlorate applied yearly has eradicated all growth on the paths and under fences.

Fertilizer has been applied only once. According to Mae, "Never again, for the soil is *too* good. Plants almost jump back at you!" She has traded plants for horse manure upon occasion. Truckloads of sawdust have been applied; fortunately no chlorosis has resulted.

It has not been necessary to use insecticide sprays — perhaps because of her isolation —

Mae in the shade house with a plant of *Rhododendron hemsleyanum* grown from ARS seed. This specimen has since been given to the Rhododendron Species Foundation because of its excellent leaf form.
Photo: Jean Henderson

except in the greenhouse. A lysol solution soil drench used when root weevil infestation is suspected has controlled that pest in her garden.

The garden areas and the three benches in the greenhouse have filled at an amazing rate. As Mae Granston has shared plants, seeds and cuttings, plant material has been gifted back to her. Plants and trees that have outgrown their confined spaces in smaller gardens have found a new home here.

She has been growing rhododendrons from seed supplied by the American Rhododendron Society Seed Exchange for many years. Good to superior things have come from this ARS seed, as witnessed by the numerous trophies and ribbons displayed on one wall of her workshop. Esther Berry, administrator of the ARS Seed Exchange, once wrote to her, "You must be wall-to-wall in rhododendrons."

Mae is raising and has collected most of the species of rhododendron in cultivation and some that are reportedly not in cultivation. Undoubtedly she has one of the largest private collections of rhododendrons in the United States, perhaps the largest. She keeps an acquisition file to record every rhododendron introduced into the garden or greenhouse.

One goal is to collect the entire Taliense Series. She plans eventually to group the species according to their series in order to make study of them easier. She intends to group the hybrids according to their breeder where possible. Halfdan Lem's hybrids are placed together in one bay, Lester Brandt's and Endre Ostbo's in their respective areas.

Azaleas are still being planted near the pond. Her most recent enthusiasm is to encourage gardeners to grow and propagate the rather neglected eastern native azaleas.

Ornamental trees have seen sited for accent, native plants retained and shrubs congenial to rhododendrons interspersed to prevent the garden from becoming dull. One discovers little gems from the plant world snuggled up to weathered stumps or nestled near gray rocks or taller trees.

This garden is a treasure house and it welcomes visitors. Excited and pleased guests have come from California, Oregon, the Middle West and as far away as Pine Mountain, Georgia, even from Germany. Each year there is an average of three cutting parties held at The Farm so that cutting material from her best plants will be distributed into Northwest gardens.

Mae standing at a bench in the greenhouse with a tray of her seedlings. Photo: Jean Henderson

Four and one-half acres is under cultivation and it seems certain that the garden will continue to spread gracefully under its green canopy until it reaches the damp coolness of the creekbank. Walking along the winding paths, the quiet is impressive, unbroken except by birds, the wind in the treetops or the music of rain. Gazing over flourishing nursery beds, reading plant labels, strolling among taller shrubs with their beautiful foliage and glowing flowers, it is not easy to visualize or imagine the battles won in ten years of development.

Mae Granston remembers the busy times, can hear the growl of the tractor, the whine of the saw, the sounds of falling limbs and trees, feel the need to change the hose placement one more time and turn with satisfaction to greet friends who are coming down the track.

Despite a multitude of challenges, her original goal — a special garden — has been met. At a time in life when many of us feel a need to slow down, an indomitable woman has proved that you can get here (her mini-arboretum) from there (her overcrowded city lot). ♠

The Mae Granston Rhododendron Study Group of the Unit Council will hold a "**Late, Late Rhododendron Show**" of trusses only at the Wells Medina Nursery (8300 N.E. 24th in Bellevue) from 10 a.m. to 6 p.m. on June 4 and 5.

It will be an accredited show with ribbons and judges, open to everyone. You need not have grown the rhododendron to enter its truss. It should be brought for entry in its own bottle on Friday morning, June 3rd before noon. Let's see how many rhododendrons are still blooming in June!

D.J. Wyble digs *Iris pseudacorus* in the garden of a unit member who can be relied on to donate this species each year.

Photos: Nancy Walz

Mary Ellen Mulder, Rhododendron Hybrids Chairman, inventories nursery plants heeled into her vegetable garden.

Behind the Scenes at the Plant Sale

The following article, largely contributed by Louise Czerniski, this year's Plant Sale Chairman, is intended to give an overview of the work that precedes the Arboretum Foundation Plant Sale.

Don't think that when one plant sale is over we just say, "Well, that's that!" Almost as soon as the last customer leaves one sale, we begin to plan for the next one and start thinking of better ways to meet some of the problems that have remained unsolved. Just as nature sets buds in the fall for spring blooms, we prepare well in advance for a successful sale.

You can't imagine how many telephone calls it takes for the Plant Sale Chairman to recruit the more than 50 department heads that are going to run the sale. It is most important to have some of them committed early because the buying must start in the fall. Even if they don't actually buy at this time, the various plant department chairmen scout around and visit with the nurseries which will be their major suppliers.

By early February each department submits a list of material expected to be available for the sale. This is given to the Research Chairman who prepares the plant sale list that is mailed to all Foundation members and prospective customers. This list must be received in plenty of time for pre-ordering.

Personnel is a key department since there are usually between 450 and 500 workers involved in the sale. Although individual chairmen recruit some of their own workers, Personnel is responsible for finding the major portion of them, for coordinating their assignments and for providing identification tags for all workers.

Donations must also get off to an early start. Arrangements must be made to winter over any plants that will be picked up in the fall. Some of them can be delivered in the spring. We urge all donors to pot material early so that we are sure the plants are healthy and are able to sustain themselves after they have been planted out.

Plants from the Patricia Calvert Greenhouse usually have been propagated and grown on for more than a year prior to the sale. Lists of suitable materials that will be ready are distributed to various department heads. On the day of the sale these small plants are further identified with green labels stating that they have been grown in the Patricia Calvert Greenhouse.

Of course, there is no use having a sale unless people know that it is going on. Besides the superb publicity by Jean Henderson, loyal Foundation members distribute hundreds of posters to local shops. Publicity is vital!

So are the numerous departments that make the sale run smoothly, for example, the people in charge of arranging traffic, setting up tables and making sure that clean-up proceeds quickly.

These are a sampling of the many contributions made behind the scenes at the plant sale. ♠

Pat Boehm, Bonsai Chairman, cajoles a young tree, pinching and pruning it to prepare it for the sale.

Maud Easton repots a young plant in the Patricia Calvert Greenhouse, giving it extra space to spread its roots before sale time.

Photos: Jean Henderson

Mary McDiarmid and Isobel Johnson of House Plant Unit 84 take cuttings for the Indoor Plant Department.

Mary Ruth Paine, Shrubs Chairman, selects plants in February at one of the larger wholesale nurseries.

Photos: Nancy Walz

Carl S. English, Jr.

October 22, 1904 — August 11, 1976

*FRANCES K. ROBERSON**

The value of Carl S. English's life could be summarized by recounting the awards and honors which he received, but if we stopped there we would miss the kindness, the multiplicity of interests and the friendliness which enriched the lives of those who were privileged to know him. You and I will remember gratefully his willingness to help identify plants for those less botanically knowledgeable than he, his desire to share his horticultural experience, his insatiable curiosity about plants the world over and his ability to observe them closely in order to understand their cultural needs.

The Carl S. English, Jr. Gardens at the Hiram M. Chittenden Locks in Seattle carry the name of this distinguished horticulturist who had for many years been responsible for the development of these gardens into a haven for botanists and plant lovers from all over the world. The bronze plaque erected at the entrance on December 10, 1974 bears his likeness in addition to the words of the dedication. However, it is the living trees, shrubs and herbs that speak more eloquently of his quiet devotion to the acquisition and growing of plants from far places. Carl English shared seeds, plants and knowledge with an international acquaintance of plantsmen, thus enhancing his own ability to bring interesting and unusual plants to the Gardens.

Carl English earned a degree in botany from Washington State University in 1929 and two years later began his career at the Locks. He undertook full charge of the Gardens in 1940 and continued thus until his retirement in 1974. In honor of his work at the Locks, the Seattle Federal Executive Board in 1969 named Carl the outstanding male civil servant of military agencies.

Carl and his wife, Edith, were particularly concerned with western and northwestern native plants, especially those from high elevations. The American Rock Garden Society presented them with a dual award in 1966 "in recognition of their limitless contributions," (ARGS Bulletin, Vol. 24, No. 3) including conservation efforts, hybridization work with native plant material and assigning cultivar names to selected natives.

Carl was also honored with a Professional Citation Award from the American Horticultural Society of which he was a member. He belonged to the American Rock Garden Society, Scottish Rock Garden Club, Alpine Garden Society of England and was a fellow of the Royal Horticultural Societies of Kew, England and Edinburgh, Scotland.

The Northwest has been fortunate in having had an international ambassador of horticultural goodwill in the unassuming and unselfish person of Carl S. English, Jr. ♠

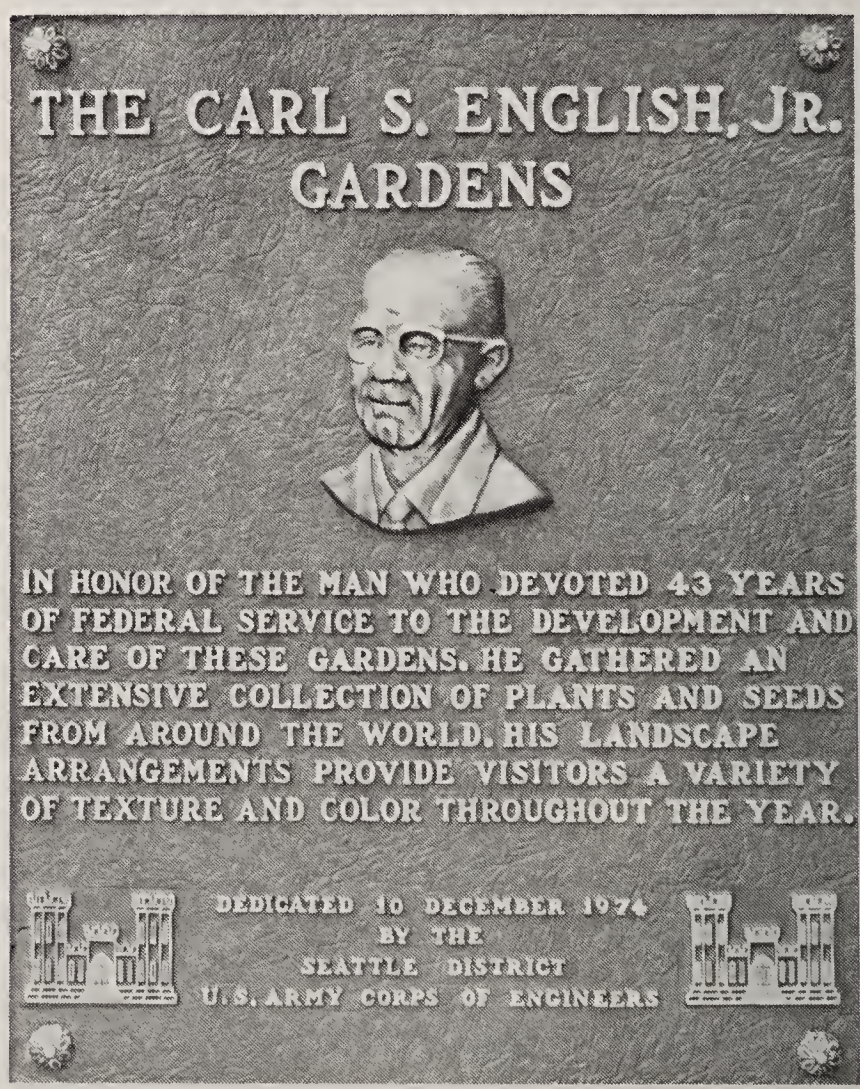

Photo: Courtesy of the U.S. Army Corps of Engineers

*Frances Roberson needs no introduction to readers of the *Bulletin*. A long time associate of the late Carl English, she has agreed to write briefly about his life and contributions to the plant world. But she feels very strongly that the best possible tribute to him would be to reprint the following article about his work at the gardens of the Hiram M. Chittenden Locks by Arthur Kruckeberg. We agree with her.

Mr. English with a specimen of one of the arborescent ericas he grew at the Locks. Photo: Courtesy of the U.S. Army Corps of Engineers

The Gardens at the Government Locks in Seattle*

ARTHUR R. KRUCKEBERG

The flow of visitors to one of Seattle's most outstanding sightseeing attractions gathers greater momentum year by year. In 1955, over 735,000 people thronged to the Government Locks, officially named the "Hiram M. Chittenden Locks" in 1956. Conjure up a mental image of this popular and familiar landmark. Then, in your mind's eye, erase the vision of the broad sweeps of lawn, the stately trees and the colorful plantings in the many spacious drifts and you have lost the elusive but significant aesthetic quality that *is* the Locks. To be sure, the average visitor enters the grounds bent on viewing the activity of boats and people at the locksides. Yet, once entering the north gate one senses the change from the clutter and crowding of city life to the serenity and expansive beauty of a park. To the knowing eye, the plantings are not at all typical of just any park or estate. The keen gardener, horticulturist or botanist is at once convinced that he has stepped into a botanical sanctuary — a true arboretum.

The seven acres of gardens at the Locks trace their origin back to 1916, when, even before the facilities were completed, plantings were begun. Much of the earliest plant materials were donated by the Seattle Park Department. However, the development of the Locks as an outstanding botanical garden must be traced from a later date. In 1931, Carl S. English, Jr., joined the staff of civilian personnel as horticulturist. From then on, the gardens began their rapid evolution towards their present renowned status as a mecca for garden enthusiasts seeking the choice, rare and the beautiful in ornamental plants. Mix a dash of taxonomist and horticulturist with liberal portions of the field botanist and "dirt gardener" and you have Carl English, the versatile plantsman. But

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that is not the whole man. With these ingredients some divine power has blended the qualities of humility, generosity, love of all nature, and unbounded energy and industry. Carl English's inborn "green thumb" was given a college education under the guiding spirit of Professor Harold St. John (now Professor Emeritus at the University of Hawaii). Among Professor St. John's loyal and enthusiastic cadre of students in botany was one Edith Hardin. Joined in marriage and deep mutual interest in plants, Edith and Carl English have made their names synonymous with the word "botany" to all their gardener friends, their many students, as well as to customers to their unique home nursery.

To say that the gardens at the Locks are Carl English's full-time vocation is an understatement. In addition to the superhuman task of maintaining the grounds with only one full-time assistant, Carl has spent many hours in the procurement and propagation of unusual ornamentals. With his first love, the native plants of the Pacific Northwest, he has, over the years, built up impressive seed and plant lists which serve as the basis for procuring the rare and unusual in plant materials by exchange. All but the oldest trees at the Locks have been grown mostly from seed, obtained through Carl's lively seed exchange with private individuals and botanic gardens throughout the world. In addition to seed sources in North America and Europe, the Englishes have carried on exchange with collectors in South America, Japan, Burma, New Zealand, China, and practically any other region of the world where plants hardy to the Northwest can be had.

What specifically has this long sustained energy brought to the Locks? For an answer we must tour the gardens. From the main gate, the visitor walks toward the Locks along a concourse lined with stately maples — the Norway maple *(Acer platanoides)* and the sycamore maple *(A. pseudo-platanus).* Half way down along the main thoroughfare, our attention is caught by a planting to the west which takes advantage of the seepage coming down from the hill off to the west. Several bald cypresses *(Taxodium distichum)* stand out among such other notable trees as *Liriodendron tulipifera,* the tulip tree; *Metasequoia glyptostroboides,* the "dawn redwood" — glamourized as the living fossil from central China, and a fine collection of tupelo *(Nyssa sylvatica).* At ground level the springy soil supports both the North American and Japanese skunk cabbage species *(Lysichiton americanum* and *L. camtschatcense)* and an extensive patch of that magnificent water saxifrage, with the huge umbrella-shaped basal leaves, *Peltiphyllum peltatum.* Equally bold and large are the leaves of an adjacent planting of *Gunnera chilensis* from South America. Both these latter plants of outsized leaves and rhizomatous habit are splendid innovations for the discriminating gardener blessed with a wet spot on his land.

Approaching the Locks proper, we encounter both formal and informal plantings, each of which contains one or more rare gems. Along one of the shop buildings can be seen a small hardy palm, *Trachycarpus fortunei,* the windmill palm of Chinese origin. Near it, we notice the dusty blue-green leaves of a semi-hardy eucalypt, *Eucalyptus gunnii.* In the broad east-west walkway between the main office and the shops, two types of Japanese cherries stand out in mid-spring, *Prunus serrulata* cultivars, 'Taizan Fukun' and what Mr. English believes is a different 'Kwanzan,' the 'Yae-Kwanzan.' In the same general area, the trained eye notes other unusual plants; the compact, bushy foxtail pine of high, arid western mountains, *Pinus aristata.* East of these can be seen magnificent specimens of *Eucryphia glutinosa,* that showy Chilean shrub with large gardenia-like flowers; nearby is an imposing specimen of the Chinese gooseberry, *Actinidia chinensis,* climbing in a tree. It is noteworthy that the survival of the Eucryphia and Actinidia through the freeze of November 1955 points out the climatic advantages of the location of the Locks near Puget Sound. Although many fine specimens were lost at the Locks during this rude, cold blast from the north, the losses here and in other gardens adjacent to the Sound were definitely less severe than those in the Seattle hinterland.

A closely interlaced planting of choice and unusual plants transfigures the mundane restrooms bordering the Locks walkway into a focal point of real aesthetic interest. The fine *Magnolia sieboldii,* with white flowers and crimson stamens around June 1, is found with more Eucryphias, Kalmia, *Pieris formosa* and others on the east side of the building. The novel use of our native flowering currant, *Ribes sanguineum,* espaliered against one of the entrances, is eye-catching. In this same planting, such species as *Arcto-*

staphylos pechoensis, Aesculus californica, A. parviflora, and the Chilean fire bush *(Embothrium coccineum)* are represented with outstanding specimens.

Taking now the S-shaped walkway westerly toward the upper road that passes the resident engineer's home, we look for other beds of particular interest. At the upper end of this walk, a notable planting includes the odd *Poncirus trifoliata,* a spiny member of the citrus family. This plant is completely surrounded by that near relative of Pieris, the evergreen *Chamaedaphne calyculata.* A particularly fine group of the arborescent *Erica australis* in both its typical (pink) and white forms is to be seen near this spot.

Having now gained the main road leading past the south entrance to the residence, a stop will surely come involuntarily. For at any time of the year, the large oval planting near the junction of the 'sigmoid' path and the upper roadway is the envy of many a gardener. In very early spring a fine witch-hazel, *Hamamelis mollis,* will bedazzle the spectator. Then, in a procession of bloom, you can look for more Embothriums, the rare *Cladrastis sinensis* (yellow-wood), the princess tree *(Paulownia tomentosa),* the golden-rain tree *(Koelreuteria paniculata),* and many other fine shrubs and trees.

On west up to the residence is a solid mass of shrubbery, given over to an array of evergreen and deciduous species. The first and lowermost along the rising road is a huge specimen of *Elaeagnus multiflora,* with light green, scaly leaves on arching branches, bearing heavily scented greenish-yellow flowers. Other memorable items along this swath are *Erica lusitanica, E. australis* again, the fine flowering cherry, *Prunus sieboldii, Tsuga mertensiana* (mountain hemlock) and *Osmanthus ilicifolius,* a handsome evergreen holly-like species. Making a remarkable showing here under the regimen of a mild climate and cultivation is the Great Basin xerophyte, *Cercocarpus ledifolius.* This evergreen, the mountain mahogany, bears narrow, dark green leaves and, after flowering, reveals dainty plumed, corkscrew seeds. An outstanding novelty at the front door of the dwelling is the "dwarf" palm, *Chamaerops humilis,* now as tall as the lower eaves of the building.

Going on from here to the extreme western end of the grounds, the rewarding view is that of the white cherry, *Prunus serrulata* cultivar 'Shogetsu,'

Aesculus californica **(California buckeye) growing on the main drive looking toward the administration buildings and the entrance to the Garden. Photo: Nancy Walz**

overlooking the Locks below and surrounded by a profusion of smaller trees and shrubs. Beyond the cherry on the west slope, Mr. English has planted one of his favorite western North American natives, the evergreen tanbark oak *(Lithocarpus densiflorus).* As of 1959, the oaks are small, but the proof of their worth and survival is seen elsewhere in the gardens. Here and there the visitor finds good-sized specimens of the tanbark oak, as well as other evergreen oaks from California *(Quercus chrysolepis, Q. vaccinifolia)* and from Europe *(Q. ilex).* It is small wonder that we are impressed with the number and quality of the broad-leaved evergreens at the Locks. Mr. English has amassed a distinctive collection of them — oaks, manzanitas, osmanthus, mahonias, barberries — a choice diversity of leaf textures and sizes. Incidentally, another favorite evergreen of his is Garrya, or silktassel bush, in its several species, all endemic to western North America. *Garrya elliptica* and *G. fremontii* are truly spectacular in the early spring with the long graceful yellow catkins of the male tree and the soft silky tassels of the females.

In almost every planting at the Locks, one finds fine rhododendrons and azaleas, both hybrids and species in several series. Just listing them would be a formidable task. But simply viewing them as one moves from one drift of shrubs to another or makes repeated visits to the Locks during a season is rewarding enough. Like the rhododendrons, conifers get a prominent place in the grounds. In addition to the ones already named, fine specimens can be seen of Japanese red pine *(Pinus densiflora),* Colorado blue spruce *(Picea pungens)* and an impressive colony of Alaska cedar *(Chamaecyparis nootkatensis).* Mr. English is endeavoring to replace the several untidy and ungainly Sawara cypresses *(Chamaecyparis pisifera* cultivars*)* with other more desirable trees. Too often one sees older specimens of this conifer dominating a landscape in a negative way. It is a species that can and should be used sparingly.

Two more species should be mentioned. Along the upper east border planting look for the conspicuous, festooning "handkerchiefs" of the dove tree *(Davidia involucrata)* in early May. These young trees have flowered in 1959 for the first time after having attained a height of 15 feet. But you will admit that the wait was worth it! For another thrill, try to find the greenhouse area, tucked away among the shop buildings to the east of the main concourse. Scrambling along the fence and running the full length of the north side of the greenhouse is a fine display of that handsome evergreen vine, *Akebia quinata,* with its unique five-leafleted foliage and a profusion of fragrant mauve flowers.

Some day, when he finds the time, Mr. English plans a checklist of the plants grown at the Locks.** When this list becomes available, it will contain a treasure-trove of fine, unusual trees and shrubs, tested over the years for survival in the Northwest. The list will be a vast expansion of the sampling assembled in this brief tribute to a truly significant horticultural mecca of the Pacific Northwest and to its creator, Carl English. ♠

**First published 1969, distributed free of charge.

Announcements from the Unit Council

Herbarium specimens, mounted and collected by the Unit Council Herbarium Committee, will be on display in the 8th floor lobby of the Hilton Hotel outside the offices of *Pacific Search* Magazine from April 1st to May 14th.

The Northwest District has planned a tour of the gardens of Mr. and Mrs. J.E. Malinowski at 10829 Kulshan Road, Edmonds (778-5006) and Mr. and Mrs. Donald Hedges, 22225 Woodway Park Road (778-4849) at 6 p.m. on May 12th. The gardens comprise four and one-half acres and include a wide variety of plantings, some shade- and some sun-loving, a bog area, a brook, an orchard and a Moorish garden. A bar will be set up and hors d'oeuvres served at the Hedges. Foundation members and their guests are invited. Call the Foundation office for a reservation, 325-4510.

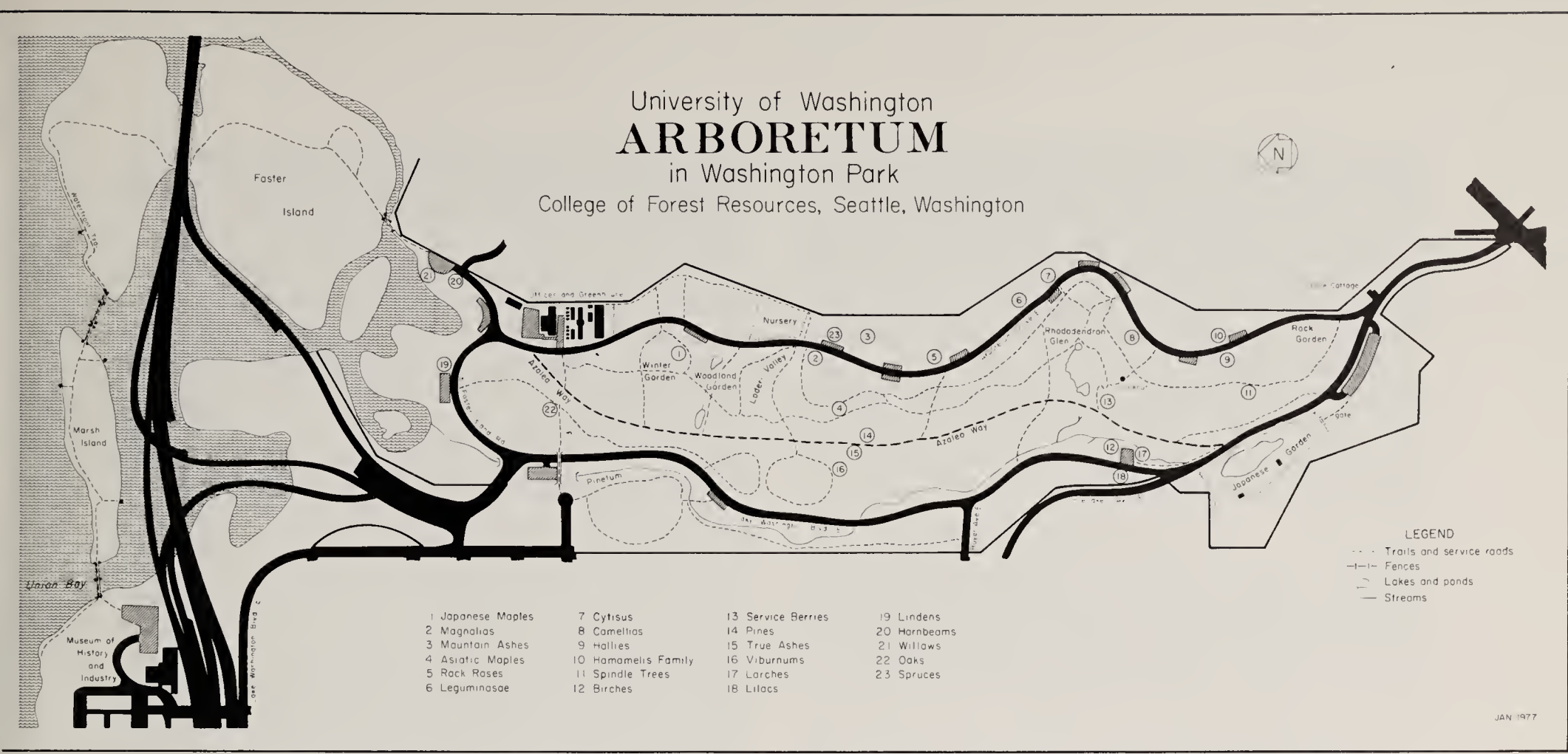
The Kitsap-Bainbridge Island District will sponsor a tour of the Prentice Bloedel Gardens on Bainbridge Island on May 25th. Call the Foundation office for more information.

A new unit, Unit 89, has been formed on Bainbridge Island.

The Arboretum has received a number of gifts from units. For books, $30 from Unit 15; for the general fund, $10 from Unit 38, and $50 from Unit 13; to be used at Joe Witt's discretion, $300 from Unit 41, $250 from Unit 32 and $10 from Unit 66. The Foundation has received a gift of $300 from Unit 54 for a table in the office for the new collator.

The last Unit Council meeting of the year will be held Thursday, May 19th at St. Stephen's Church, Laurelhurst beginning at 9:30. The Thorgrimson Cup will be awarded to the unit that has contributed the most service to the Arboretum and a prize will be given to the unit with the best yearbook.

RUTH MARY CLOSE



This map of the U.W. Arboretum in Washington Park will be included in the new catalogue. Doubtless it will one day be obsolete when the new master plan is put into effect (See p. 10).

Catalogue of Plants in the Arboretum

The long-awaited *Catalogue of Woody Plants in the University of Washington Arboretum in Washington Park* will soon be available in paperback and hardcover editions. Brian O. Mulligan, Director Emeritus of the Arboretum, has prepared it from card files and records first set up about 1940.

The 390 genera and 2168 species as well as subspecies and varieties are arranged alphabetically for convenience. Cultivars are listed under their particular species. In all, 4605 taxa are represented.

Each species entry includes the common name (if any), the country or countries where native, the first date of planting in the Arboretum and a grid reference or references to locate the plant on the fold-out map which is included in the work.

Plants native in the Arboretum, those raised from wild collected seeds or plants and cultivars received from original sources are marked with *. Those found not reliably hardy are marked +.

The catalogue is expected to be especially useful to horticulturists and nurserymen as well as to gardeners and plant lovers in the Pacific Coast states and the province of British Columbia. It will be for sale at the University of Washington Arboretum, Seattle, Washington 98195.

Book Reviews

WILD FLOWERS OF THE PACIFIC NORTHWEST, by Dr. Lewis J. Clark, edited by John G. Trelawny. Gray's Publishing Ltd., Sidney, B.C., Canada, 1976. 604 pages, many illustrations. Price $50.00.

This superb volume extends the area of the late author's previously published *Wild Flowers of British Columbia* (1973) to cover plants of the Pacific Coast states from Alaska to northern California. Following the death of Dr. Clark the present work was prepared by John Trelawny of the Department of Biology, University of Victoria, B.C., where he was a friend and associate of the late author.

Mr. Trelawny added more than a hundred new color plates, chiefly from Dr. Clark's extensive collections but also from several local contributors to bring the total up to nearly 660, usually with three or four on a page. These are almost all of high quality. Where they have been enlarged up to two or three times natural size (the amount of enlargement or reduction is given for each plate) and printed on a full page, the results are often works of art; for example, *Fritillaria lanceolata* (a single flower) and *Drosera rotundifolia*. Common introduced plants such as Scotch broom *(Cytisus scoparius)* and the yellow flag iris *(Iris pseudacorus)*, and such weeds as common sorrel *(Rumex acetosella)*, petty spurge *(Euphorbia peplus)* and purslane *(Portulaca oleracea)* are included, which will certainly aid in their recognition and identification.

In the text, which appears to be largely the work of Dr. Clark, both the genera within the families and species within genera are arranged alphabetically for greater ease of reference. His frequent notes on the meaning and derivation of plant names, and the history, uses and interesting chemical features of many of the plants described add much to the practical value of this beautiful book; for example, the skunk cabbage, round-leaved sundew, and the two buffalo berries, *Shepherdia argentea* and *S. canadensis*. Even the pollination habits of bees on such plants as fireweed *(Epilobium angustifolium)* are described.

Near the end of the volume is an illustrated glossary which includes diagrams of the flower parts of four important plant families, as well as the more usual outlines of leaves and various types of inflorescences. This is followed by a comprehensive bibliography of almost 100 items, and finally an index of both common and Latin names, those illustrated being printed in boldface type. Both end pages carry double-page maps showing the area covered. The work is printed in large type on glossy paper, resulting in a product on which the printer, publisher and editor are all to be congratulated. It is only regrettable that the high price will undoubtedly greatly limit its sale.

BRIAN O. MULLIGAN

SHOULD TREES HAVE STANDING? TOWARD LEGAL RIGHTS FOR NATURAL OBJECTS, by Christopher D. Stone. 1972. Discus Books, published by Avon, New York (Paperback reprint, 1975). Price $1.50.

This remarkable book by Christopher D. Stone, Professor of Law at the University of Southern California, appears to have become a classic of environmental literature. Like Aldo Leopold's *A Sand Country Almanac,* several decades ago, this recent work has become a benchmark. *Should Trees Have Standing* is essential reading for anyone concerned with conservation, nature, and the protection of our rapidly depleting environment. A great forward step in the concept of the environmental revolution in which we are all participating, to a greater or lesser degree, is most cogently set forth.

Professor Stone states in this persuasive treatise, "I am quite seriously proposing that we recognize the legal rights of forests, oceans, rivers and other so-called natural objects." The author skillfully outlines the development of law in human society. He feels that the law must not stop growing. As our society has advanced in its concept of human rights, Professor Stone contends that the time has come for us to acknowledge the rights of trees, streams and wilderness areas. Now comes a thought-provoking idea! He says that the important thing is to establish the principle that the environment should be represented by counsel in court. He argues further that when a friend of a natural object perceives it to be in danger, he can apply to the courts for the guardianship of its rights.

Professor Stone looks forward to a gradual change in our underlying attitude towards the environment. He cites a number of cases that have already come up in court. In looking to the future, the author feels that there is a significant change in attitude now taking place. The environment's intimacy with the law is, he feels, inevitable. There have been judicial victories but, win or lose, or good or ill, the whole movement is bound up in our laws and legal apparatus.

In *Should Trees Have Standing,* the author admits that no rights are absolute. He admits that compromises would have to be made and balances struck in administering the law. He continues in this manner, "Forests are going to be cut and fish fished. The social tag of putting the new practises into effect may often be too high."

This important book is not leisure-time reading. It is a revolutionary approach to the whole subject of the protection of the world around us. How to protect it better is a vital question! Anyone concerned about the environmental movement should read this book. It is straightforward, challenging and thought-provoking.

ROSAMOND ENGLE

PLANT AND PLANET, Anthony Huxley. The Viking Press, New York, 1975. 432 pp. With frontispiece and 51 other illustrations. Price $14.95.

After the recent assault on our common sense by such books as *The Secret Life of Plants,* reviewed in the *Arboretum Bulletin,* Winter, 1974, one picks up Anthony Huxley's latest work with relief and high expectations. Born in 1920, a scion of the famous Huxley family, Anthony Huxley is the author or co-author of several other worthwhile books on plants (see the review of Polunin and Huxley's *Flora of the Mediterranean, Arboretum Bulletin,* Summer, 1966). In the present book his avowed purpose is "to stimulate interest in the world of plants and our perception of it." Throughout, he has assumed that the reader has "a more than passing interest in the plant world . . . [and the kind of experience] that gives him an almost subliminal understanding of plant arrangements." It is clearly the author's hope that *Plant and Planet* can be read and enjoyed with or without much technical knowledge.

Avoiding such complex matters as the internal workings of the cell, Huxley has concentrated on the more extraordinary aspects of the plant's performance, especially within the group of the flowering plants. In 30 chapters we find interesting and sometimes fascinating information on such subjects as the evolution, structure and performance of plants; the interactions with their living and non-living environment (for example, their chemical warfare, seed dispersal, germination, pollination and diseases); their importance in agriculture, art, medicine; parasitic higher plants; and the outlook for the future.

Whether or not the author has succeeded in his self-imposed task is a matter of opinion. There is much to applaud in this book, and one must certainly admire Huxley's erudition and knowledge of literature. However, the unsophisticated reader may well feel overwhelmed. As an example, for illustrations of the text the reader is referred to books quoted in the bibliography (which books?). The author's decision in this case must be considered a serious error in judgement. If Huxley's descriptions were always adequate, there would of course be no problem, but unfortunately that is not the case, as in the instance of the incorrect description of the milkweed flower and its pollination (p. 141).

The few illustrations provided are mostly from Kerner von Marilaun's *Natural History of Plants* published in English translation more than 80 years ago! These may provide a certain quaint charm but are frequently worse than useless in the light of present day knowledge. For example, on page 245 we find Kerner's super-romantic picture of "ants protecting honey-rich knapweed flowers against a large pollen-eating beetle." The legend cannot fail to imply that the heroic ants defend the floral nectar (honey) in which they have a proprietary interest, whereas in reality they protect the extrafloral nectar produced on the bracts of the involucrum.

There are several other errors in the book as well as self-contradictions and non-sequiturs. For example, cherry laurel *(Prunus laurocerasus)* does not have nectaries on the stems (p. 250) but on the petioles and even the leaves; the fecal smell produced by Lords and Ladies *(Arum maculatum)* is not the cause of the spectacular temperature rise of the appendix (p. 139) but simply accompanies it; the germination of seeds on a forest floor is not inhibited by red light but by far red light; the giant waterlilies (the genus *Victoria?*) do not indulge in self-pollination with the aid of beetles (p. 131) but are

cross-pollinated by them. One might also challenge the statements that "hummingbirds are as sensitive as bees to colors which humans cannot detect" (p. 143) and that in some forests in west Central Africa the temperature at ground level is 70 to 80° C. And so on.

There is an extravagant use of common names without giving the Latin ones. What are "American pitcher plants" — *Sarracenias, Darlingtonias,* or both? What is a "spear lily," "tape grass" and a "night-blooming moonflower"? The few Latin names given are sometimes misspelled. The omission in the list of references of Faegri and Van der Pijl's pollination book and that of Verne Grant's name and work is annoying when one finds several authors of much lesser stature included. Finally one cannot fail to notice a certain degree of sensationalism: if the (hemispherical) tuber of *Amorphophallus titanum* really had a diameter of "more than one and one half meters" it would weigh more than 850 kilograms or 1,900 pounds; in reality one weighing 200 to 300 pounds is already considered quite respectable.

Plant and Planet leaves me with the final impression that reading it can be a good review for those who already have a fair amount of sophistication and experience in botany, combined with critical sense and some familiarity with the literature.

BASTIAAN J.D. MEEUSE

A QUEST OF FLOWERS – THE PLANT EXPLORATIONS OF FRANK LUDLOW AND GEORGE SHERRIFF, by Harold R. Fletcher. Edinburgh University Press, 1975. 387 pages. Price 10 pounds.

Ludlow and Sherriff were characterized in this book as "knowledgeable and resolute plant collectors whose rewarding journeys in the eastern Himalaya and in southeastern Tibet have added greatly to our knowledge of the flora and natural history of these regions and whose strenuous efforts on hazardous expeditions have enriched our gardens by the introduction of plants of outstanding merit." Their names are not as well known as the names of other plant explorers of their time: George Forrest, Frank Kingdon-Ward and Joseph Rock. Neither of them was a writer or lecturer or in any other way brought himself to wide public notice. These two Englishmen had both come to the Himalaya in their professional capacities — Frank Ludlow as educator, George Sherriff as professional soldier. On meeting in 1929, their common love of out-of-the-way places, flowers, birds and field sports led them to the resolution to make biological exploration their retirement occupation.

A Quest of Flowers is not for the casual reader, nor for one looking for cultural information about specific plants, but rather for one interested in the how, what, where and when of discovering and collecting in the Himalaya. The reader, if he were to be transported to the area, could almost put his feet in their footprints and collect the same plants, so detailed is the information. The author, Dr. Harold Fletcher, was formerly Keeper of The Royal Botanic Garden, Edinburgh. He has drawn extensively from the diaries of Frank Ludlow and George Sherriff to present material that is scientifically accurate as well as colorful.

The introduction by Sir George Taylor FRS (former Director at Kew) relates the work of Ludlow and Sherriff to that of Rock, Kingdon-Ward and other explorers of the period covered (1933-1949). It also includes a brief history of plant collecting in this area of southeastern Asia.

The botanical index lists some 100 genera with the greatest number of species under *Gentiana, Primula, Rhododendron* and *Saxifraga.* The book has 106 black and white photographs of plants, places and people, numerous maps and seven color photographs. The paper and printing are of high quality.

Mrs. Sherriff participated in the plant hunting at times. The following description exemplifies the narrative talents of the author. In May of 1949 Mrs. Sherriff was in a party separate from that of her husband. The night before they were to start collecting she ". . . dreamt that her husband walked into her tent, stood beside her camp bed, and gave her instructions for collecting on the following day. She was to seek out below the camp a small track leading to the Me La; to follow the track for about 3 miles until bifurcated; to take the right hand fork and walk some 300 yards to a large rock mass. On the far side of the rock she would see a poppy she hadn't found before. As Sherriff left the tent he turned, shook a finger at her, and said 'Be sure you go.' The next morning, at their usual 5 a.m. breakfast, when she told Hicks and Tsongpen the substance of her dream, they were both very skeptical and urged her to keep to their original plan . . . But the dream, and especially the shaking finger, had been so vivid and the instructions so clear and positive, that she determined to leave the rest of the party and to seek her dream poppy. She had no problems; she found the track easily; she found the mass of rock easily; and behind it she found a glorious blue meconopsis which she hadn't collected before, a form of *Meconopsis grandis* . . . Mrs. Sherriff wrote to her husband telling him of her experiences; she asked if, on that particular night of 25 May, he had been thinking of *Meconopsis grandis,* or of his wife. Sherrif's reply: 'Neither!' "

RUTH VOROBIK

NEW PRONOUNCING DICTIONARY OF PLANT NAMES, Florist Publishing Co., 20th Printing, 1974. Price $.50 from Arboretum Foundation Book Chairman.

THE PACIFIC GARDENER, by A.R. Willis. Superior Publishing Company, 7th Edition (paperback), 1975. Price $5.95.

This book covers almost all phases of home gardening (also small farms) from planning, planting and harvesting through propagation and maintenance of decorative as well as food plants.

New Members of the Arboretum Foundation

We are pleased to welcome the following new members (October 16, 1976 through January 18, 1977):

Sustaining – Mrs. John D. Bert, Benjamin Blackburn, Stephen Dixon, Mrs. J.F. Doan, Charles E. MacMahon, M.D., Duane R. Spofforth, Ms. Laura M. Stockley, Ridgeside Garden Club, Whispering Heights Garden Club. *Annual* – Mrs. Bill Alexander, Mrs. Bruce Barden, Mrs. Steve Barden, Gary Barton, Gladys Bloom, Mrs. Marie Cable, Mrs. W.S. Coon, James Cowdrey, Mrs. Irene Cowell, Mrs. Rosemary Cummings, Mrs. Brian W. Dickerson, Kathy Dickerson, Mrs. John A. Dowling, Mrs. A.N. Dunlop, Mrs. Maud M. Easton, Mrs. Charles S. Fegan, Mrs. Ernest Frankenberg, Ms. Charlotte L. Frazier, Mrs. Elsbeth B. Hansen, Barbara J. Harris, Mary Ann Hornick, C.K. Iverson, Ms. Nancy S. Juneby, Mrs. A.V. Liburdy, *Mrs. Margaret Lindsell, *Mrs. Roxanne S. Marotte, Mrs. Paul R. Meyer, Mrs. Helen H. Mitchell, *Mrs. Sharon Moore, Lloyd W. Morgan, Mrs. Chase Morris, Mrs. Jack Owen, Mrs. John G. Peterson, Mrs. Albert Pierce, Mrs. Bernard Pipe, Gizelle Rayner, Mr. and Mrs. Donald P. Ridgway, Mrs. Gordon Roberts, Mrs. J.R. Roller, Mrs. Jane Ross, Mary Sambrook, Mrs. Lynne W. Schlosser, Miss Viola M. Shields, Mr. and Mrs. Ronald A. Slott, Ms. Jeanne Littler Smith, Mrs. Dorothy Stewart, Mrs. Robert N. Strand, Jacqueline K. Swofford, Mrs. Grace L. Truscan, Nick Ward and Jean Thomas, Mrs. William R. Weber, Mrs. Irving L. Webster, Mrs. Robert Weeks, Mrs. D. Williams, Mrs. Judy Williams, Mrs. Robert D. Williams, Robert G. Yates, Judith Y. Young, Ruth F. Zilly.

*Of these 66 new members, 3 have joined as a result of participation in the recent Bulb Sale.

We are also grateful to the following who have increased their dues to: *Supporting* – Mr. and Mrs. N. Stewart Rogers. *Contributing* – Mrs. Kenneth R. Boyle, H.S. Houghton, Mrs. Florence L. Putney. *Sustaining* – Mrs. Wendell L. Black, Captain and Mrs. Arthur P. Gardiner, Mrs. L.C. Heath, Mrs. W. Ryland Hill, Mrs. Gordon Logan, Mrs. V. Sivertz, Miss Margaret Weeks.

University of Washington Classes

Arboretum Courses

Spectrum, the quarterly journal for Continuing Education, is sent free to those who have indicated interest in the University of Washington's night courses, adult education classes, concerts and other cultural activities. Those who wish to obtain early notice of such classes are urged to place their names on its mailing list by calling 543-2590.

SPRING TOURS. Tours of the Arboretum grounds in spring bloom. Instructor: Joseph Witt. Class limited to 20; meet at Arboretum office. Saturdays, April 2, 16, 30, May 14, 28, June 11; 10-12 a.m. 6 sessions, $10.

BIRD IDENTIFICATION FOR BEGINNERS. Field class on land birds commonly found in the Arboretum and waterfowl on Lake Washington. Binoculars required; appropriate clothing and boots recommended. Instructor: Merilyn Hatheway. Class limited to 15; meet at Arboretum office. Saturdays, March 26, April 2, 16, 23, 30, May 7; 9-11 a.m. 6 sessions, $15.

IDENTIFICATION OF NATIVE TREES AND SHRUBS. Field class covering 40 species of common trees, shrubs, and ferns native to western Washington. Instructor: Connie Millar. Each section limited to 15; meet at Arboretum office. Saturdays, April 30, May 7, 14, 21; 4 sessions, $10. Section A: 10-12 noon. Section B: 12-2 p.m.

BASIC GARDEN MAINTENANCE. Basic gardening techniques including soil preparation, planting, fertilizing, mulching, pruning and seasonal care of plants. Instructor: Chico Narro. Class limited to 15; Arboretum greenhouse. Saturdays, April 2-May 7; 10-12 noon. 6 sessions, $15.

HOUSE PLANTS. Identification, techniques of propagation and care of indoor plants. Materials and plants furnished. Instructor: Richard van Klaveren. Class limited to 15; Arboretum greenhouse. Thursdays, April 28, May 5, 19; 7-9 p.m. 3 sessions, $15.

For further information, call 543-2730. To register, send a check, made payable to the University of Washington, to: Arboretum Courses, Anderson Hall (Ar-10), University of Washington, Seattle, WA 98195.

Continuing Education

During Spring Quarter, 1977 the University will offer non-credit courses in several subjects of interest to readers of the *Bulletin.* Dr. C. Leo Hitchcock will repeat his class, "Identifying Plants of the Pacific Northwest," a perennial favorite with plant lovers in this area. Dr. Elva Lawton, the foremost expert in her field, will give a course in "Identifying Mosses and Liverworts in the Pacific Northwest." Dr. Robert Edmonds, Assistant Professor of Forest Resources and Director of the Pack Forest, and James Wood, M.S., Forest Entomology, will offer a survey of "Insects and Diseases in Ornamental Plants" covering both indoor and outdoor varieties.

Have you placed your name on the mailing list for *Spectrum*? For information call 543-2590.

CALENDAR OF EVENTS

Arboretum Foundation:	
Executive Committee	April 14
	May 12
Annual Membership Dinner	June 9
Unit Council:	
Governing Board	April 7
	May 12
	June 9
Unit Council Meeting	May 19

Regularly Scheduled:	
Greenhouse Day	Every Tuesday
The Mae Granston Rhododendron Study Group	1st Monday
Herbarium Committee	1st Friday
The Mae Guy Northwest Natives Study Group	3rd Monday
Rock Garden Study Group	3rd Wednesday
Special Study Group	4th Monday
Arboretum Explorers	4th Wednesday

DATES TO REMEMBER

Work and Fun Day April 14
Arboretum Foundation Plant Sale May 4 & 5

FOR INFORMATION, CALL 325-4510

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THE ARBORETUM BULLETIN

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REMEMBER

The Arboretum Foundation Plant Sale

Wednesday, May 4th, from 4-8
Thursday, May 5th, from 10-4

To offer donations call
Mr. and Mrs. Victor Sivertz (Chloe)
522-7252.

For that special plant
pre-order from
Barbara Andersen (Mrs. James)
232-0752.

If you would like to work on
the sale, give your name to
Margaret Parsons (Mrs. Buck)
454-5897.

Photo: Jean Henderson

Gwen Bell heeling in rhododendrons for the plant sale.

Customers are assured an abundance of new, unusual and quality plant material.

Eighteen different departments have been growing, collecting, and buying for months to provide a good selection. Another fourteen service-oriented departments will see that the sale runs smoothly.

See article "Behind the Scenes at the Plant Sale" on pages 22 and 23 of this issue.